

More proximal upper limb replantations may occasionally be done in younger patients. Lower limb replantations are rarely indicated because a prosthesis can substitute for the amputated part in a more functional, timely and economical manner.

When an amputation has occurred, bleeding in the proximal stump should be controlled by direct compression and elevation. The amputated part should be wrapped in a clean or sterile bandage and placed in a waterproof container such as a plastic bag or cup. The container should be placed on ice to keep the part cold but not frozen. Once cooled the amputated part can withstand at least several hours of anoxia, but the replantation procedure should be initiated at once. The primary physician should examine the proximal limb and the amputated part both visually and radiographically. With this information the physician can then contact a replantation center for consideration of patient transfer.

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Foot Problems in Diabetes Mellitus

RECENT ADVANCES in the treatment of diabetic foot problems have enabled physicians to significantly increase the percentage of feet and legs salvaged. Advances in the techniques of vascular assessment, revascularization and in limited amputation have enabled the salvage of many ischemic feet and legs. Use of the total contact cast with associated techniques has enabled salvage of legs that have neurotrophic foot ulcers.

Although clinical examination is still the principal means of vascular evaluation, use of the Doppler ultrasound stethoscope has enabled physicians to recognize pulsatile flow in an extremity, which cannot be detected by the usual clinical methods. With the use of the Doppler instrument and various-sized blood pressure cuffs, segmental blood pressures can be determined in a limb. A systolic pressure of 70 mm of mercury or higher or a pressure of at least 45 percent that of arm pressure is an indication that a limited amputation at that level can succeed or that an ischemic ulcer at that level can heal. Promising new techniques have been developed that can directly measure the vascularity and healing potential of skin. These include measurement of transcutane-

ous partial oxygen pressure (PO_2) and measurement of skin blood pressure and skin blood flow, both recently reviewed by Burgess and Matsen. The techniques of Doppler examination and limited amputation have been reviewed recently by Wagner. Toe amputations, transmetatarsal amputations, ray resections and Syme's amputations have been successful when leg to arm pressures are 45 percent or better by Doppler examination. A value less than 45 percent can, in some instances, be raised by an endarterectomy or a bypass graft and a limited amputation can then be done.

The total contact cast completely encloses a foot and leg in a clean, protective environment. It allows ambulatory treatment of foot ulcers when vascularity is adequate and when infection is under control. Adequate vascularity is determined by Doppler examination. Before application of the cast, the foot ulcer must be thoroughly debrided and a povidone-iodine dressing applied. Infections are treated by standard means and healing in the cast generally will occur in four to six weeks. A recurrence of the ulcer can be expected if the underlying pressure points are not relieved. This is done by wearing an extradePTH shoe with a foamed polyethylene (Plastazote) insole or by surgical excision of bony prominences.

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The Treatment of Acetabular Fractures

THE CONCEPT has been held for many years that most displaced acetabular fractures are best treated with attempts at reduction and subsequent immobilization for many weeks by skeletal traction. The particular problems associated with this approach have been the less-than-adequate reduction of the articular surface of the hip, the frequent displacement of the head on releasing traction in central fracture dislocations and the early onset of degenerative changes in the joint. More recently the possibilities and advantages of open reduction and internal fixation of acetabular fractures have been advanced to parallel the accepted approach to other intra-articular fractures.

To arrive at a complete diagnosis and appropriate treatment plan for an acetabular fracture,

one must fully discern the fracture configuration in the anterior and posterior lips or columns of the acetabulum. Thus a radiologic examination, including Judet 45 degree iliac and 45 degree obturator oblique views, often supplemented by computerized tomography, is necessary. The appropriate incisions and order of approaches (anterior, posterior or lateral transtrochanteric) may then be planned and reduction and fixation with modern instrumentation and implants can be satisfactorily achieved. A reconstructive surgical repair of an acetabular fracture is not necessarily an emergency procedure; in fact, it is usually advantageous to obtain all the special radiologic studies and analyze them at leisure. An operation should, however, be done within three weeks of the accident, after which time bone union is advancing and reduction becomes very difficult.

Advantages of operative intervention in the treatment of acetabular fractures include being able to remove loose intra-articular fragments, obtain an anatomic reduction and stable internal fixation, facilitate early joint motion, dispense with traction and prolonged bed rest, permit early discharge from hospital, decrease the incidence of degenerative hip disease and facilitate future reconstructive operations if the latter supervene. Disadvantages of the surgical approach to treatment include the possibilities of infection and sciatic nerve injury. An acetabular fracture reconstruction can be lengthy and difficult and should be done by an orthopedic surgeon trained and experienced in such procedures.

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Rattlesnake Bites: Current Hospital Therapy

THE TREATMENT of persons bitten by rattlesnakes varies throughout the country. Some authors advocate that all envenomated patients undergo extensive surgical debridement and subfascial exploration. Others believe that even routine surgical procedures are too radical and suggest that antivenin given intravenously is the method of choice. This controversy has raged for many years.

Using a Wick catheter to measure interstitial fluid pressures in subcutaneous and intracompartmental tissues, we developed a laboratory model to better evaluate the effects of venom, antivenin and operative procedures on tissue pressure and destruction. A solution of 3 mg of desiccated crotalid (*Crotalus veridi helleri*) venom that was dissolved in 0.2 ml of normal saline was injected into the anterolateral compartments or subcutaneous space of canine rear legs. The pressure in these tissues was then monitored with Wick catheters and at 48 hours or longer, the dogs were killed and their compartments and tissues were evaluated histologically. From this study, we determined that only with direct intramuscular injection of the venom was there any involvement of the intracompartmental space. A fasciotomy done before the envenomation could help relieve the pressure, but had no effect on muscle destruction, as noted histologically. Conversely, high doses of antivenin modestly reduced the pressure rise, but definitely helped preserve the microscopic viability of the muscle cells.

Because of these studies we began a clinical project wherein all patients bitten by rattlesnakes had Wick catheter pressure determinations before treatment. If the intracompartmental pressures were less than 30 mm of mercury, no operation was recommended. In more than 15 patients evaluated, no surgical procedure was recommended, but high-dose antivenin was given intravenously and all patients responded functionally and systemically. All were in normal condition after three to four days.

Because of the basic science study, correlated with our clinical trial, we now feel there is sound rationale for avoiding surgical intervention and initiating a medical (antivenin) regimen in most patients following rattlesnake envenomation. If clinical evidence of envenomation develops, we initiate antivenin therapy and measure intracompartmental tissue pressure. If pressures measure over 30 to 40 mm of mercury, we recommend fasciotomy to reduce any additional insult to the compartment contents by the elevated pressure—an effect separate from that of the venom. In all cases, envenomated patients should receive antivenin of four to five vials per hour for adults and up to eight to ten vials per hour for small children. If a bite is subcutaneous and muscular involvement is minimal, we feel surgical decompression is unwarranted. To date we have cared for more than 700 persons envenomated by rattlesnakes,